UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

1-7312

August 9, 2001

REPLY TO THE ATTENTION OF:

DE-9J

Mr. Robert Hiller
Solutia Inc.
500 Monsanto Avenue
Sauget, IL 62206-1198

RE: Ecological Risk Assessment for
W.G. Krummrich Plant, Revision 1
Solutia Inc.
ILD 000 802 702

Dear Mr. Hiller:

The United States Environmental Protection Agency (U.S. EPA) has reviewed Solutia's Ecological Risk Assessment (ERA) dated June 1, 2001. The assessment evaluates the impacts of site-related contaminants on aquatic habitat in the Mississippi River and concludes that contaminants in groundwater discharging to the Mississippi River pose a risk to fish and invertebrates.

U.S. EPA's comments on the ERA are enclosed. If you have any questions, I can be reached at (312) 886-7566 or at bardo.kenneth@epa.gov

Sincerely yours,

Kenneth S. Bardo

Kenneth S. Bardo
EPA Project Manager
Corrective Action Section

Enclosure

cc: Jim Moore, IEPA
Gina Search, IEPA

bcc: Michael McAteer, Superfund
Rick Hersemann, Tetra Tech EMI

AUTHORS FILE COPY

ENCLOSURE

General Comments

1. **Consistency with Consent Order and EPA Guidance**. The data collected and presented in the Ecological Risk Assessment (ERA) are adequate to support a preliminary risk assessment for the endpoints selected; however, the text and analyses included in the ERA are not sufficient to meet the requirements of U.S. EPA ERA guidance (EPA 1997, 1998). As discussed in the specific comments, many ERA sections specified by EPA guidance are incomplete or inadequate. Despite the deficiencies identified, the data provided in the ERA and U.S. EPA's sediment data support the conclusion of the ERA that contaminants in groundwater discharging to the Mississippi River pose a risk to fish and invertebrates.

2. **Comparison of Solutia and U.S. EPA Sediment Sample Analytical Results**. During field sampling activities at the Solutia facility in October and November 2000, U.S. EPA collected and analyzed three split samples and 20 non-split samples. The sediment sample locations used by Solutia and U.S. EPA are shown in Figures 1-1 and 1-2.

The comparability of Solutia and U.S. EPA sample data was assessed. The results for non-split sample MR-SD-3-99 and its field duplicate MR-SD-3-25, were practically identical and contaminants were generally not detected (see Table 1-1). In contrast, non-split sample MR-SD-6-90 had concentrations of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) that were lower than those detected in its field duplicate, MR-SD-6-25. These U.S EPA results appear to indicate that sediment contamination is heterogenous.

Differences in the results were observed to a greater extent in Solutia and U.S. EPA split samples. For example (see Table 1-2), the VOC concentration in the Solutia sample collected at location PDA-5-R-60 was higher than that detected in U.S. EPA's split sample. However, the SVOC concentration in U.S. EPA's split sample was higher than that detected in Solutia's sample from the same location.

The split sample results indicate that sediment contamination is heterogenous. As a result, a relatively large number of samples would be required to derive representative concentrations for use in site characterization. Careful adherence to the data quality objective (DQO) process (EPA 1999) to develop sampling and analysis plans for future work is recommended. The DQO process will support derivation of statistically defensible sample sizes.

Tables 1-1 and 1-2 summarize the validated analytical results for U.S. EPA's non-split and split sediment samples, respectively.

Compounds detected in both non-split and split U.S. EPA sediment samples are:

- VOCs: benzene; chlorobenzene; 1,2-dichloroethane; ethylbenzene; toluene; and total xylenes
- SVOCs: aniline; bis(2-ethylhexyl)phthalate; 4-chloroaniline; 2-chlorophenol; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; 2,4-dichlorophenol; 3-methylphenol; and phenol
- Pesticides: delta-BHC; chlorobenzilate; 4,4-DDD; and methoxychlor
- PCBs: Aroclor 1016, and Aroclor 1248
- Herbicides: 2,4-D

All of the VOCs detected in U.S. EPA sediment samples were also detected by Solutia. The maximum detected VOC concentrations in micrograms per kilogram (µg/kg) are:

benzene	58 µg/kg
chlorobenzene	10,000 µg/kg
1,2-dichloroethane	110 µg/kg
ethylbenzene	2 µg/kg
toluene	12,000 µg/kg
total xylenes	120 µg/kg

U.S EPA's maximum detected concentration of chlorobenzene and toluene exceeded Solutia's maximum detected concentrations for these compounds. VOCs were detected at U.S. EPA sediment sample locations MR-SD-2-50 (chlorobenzene) and MR-SD-2-150 (benzene and chlorobenzene) north of Solutia's most northerly transect. VOCs were detected at U.S. EPA sediment sample locations MR-SD-6-90 (chlorobenzene), MR-SD-7-150 (benzene and chlorobenzene), and MR-SD-9-51 (chlorobenzene) south of Solutia's most southerly transect.

SVOCs detected in U.S. EPA sediment samples that were not detected or not analyzed for by Solutia include aniline, bis(2-ethylhexyl)phthalate, and 1,3-dichlorobenzene. The maximum SVOC concentrations detected in U.S. EPA sediment samples are:

aniline	3,900 µg/kg
bis(2-ethylhexyl)phthalate	93 µg/kg
4-chloroaniline	6,400 µg/kg
2-chlorophenol	400 µg/kg
1,2-dichlorobenzene	190 µg/kg

1,3-dichlorobenzene	150 µg/kg
1,4-dichlorobenzene	1,700 µg/kg
2,4-dichlorobenzene	610 µg/kg
3-methylphenol	95 µg/kg
phenol	3,200 µg/kg

U.S. EPA's maximum detected concentration for 4-chloroaniline, 2-chlorophenol 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene exceed Solutia's maximum detected concentrations for these compounds. One SVOC (4-chloroaniline) was detected at location MR-SD-2-150 upstream of Solutia's most mortherly transect. SVOCs were also detected at U.S. EPA sediment sample locations MR-SD-6-90 (1,2-dichlorobenzene and 1,4-dichlorobenzene) and MR-SD-7-150 (4-chloroaniline) downstream of Solutia's most southerly transect.

Organochlorine pesticides detected in U.S. EPA sediment samples that were not detected or were not analyzed for by Solutia include delta-BHC, chlorobenzilate, and methoxychlor. The maximum organochlorine pesticide concentrations detected in U.S. EPA sediment samples are:

delta-BHC	44 µg/kg
chlorobenzilate	21 µg/kg
4,4-DDD	14 µg/kg
methoxychlor	3.4 µg/kg

U.S. EPA's maximum detected concentration for 4,4-DDD exceeded Solutia's maximum detected concentration for this compound. Organochlorine pesticides were not detected upstream and downstream of Solutia's most northerly and southerly transects.

No PCBs were detected by Solutia in its sediment samples. The maximum PCB concentrations detected in U.S. EPA's sediment samples are:

Aroclor 1016	120 µg/kg
Aroclor 1248	84 µg/kg

No PCBs were detected in the U.S. EPA sediment samples collected upstream of Solutia's most northerly transect. However, Aroclor 1248 was detected at U.S. EPA sample location MR-SD-6-90 which is downstream of Solutia's most southerly transect.

The herbicide 2,4-D was detected in one U.S. EPA sediment sample and was also detected by Solutia. The 2,4-D concentration in Solutia's sediment sample exceeds the U.S. EPA sample concentration. Herbicides were not detected in U.S. EPA sediment samples collected upstream and downstream of Solutia's most northerly and southerly transects.

3. **Data Quality**. The ERA indicates that several chemicals had analytical reporting limits that exceeded criteria and that such chemicals were eliminated from the risk assessment as compounds of potential concern when they were not detected. The general practice is to discuss the uncertainties associated with such chemicals when required reporting limits are not met or when reporting limits exceed criteria. The specific comments below recommend that such chemicals be retained in the risk assessment and that the uncertainties associated with high reporting limits be discussed.

REFERENCES

U.S. Environmental Protection Agency (EPA). 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments." Interim Final. Office of Solid Waste and Emergency Response. EPA 540-R-97-006. June.

EPA. 1998. "Guidelines for Ecological Risk Assessment." EPA/630/R-95/002F. April.

EPA. 1999. "Data Quality Objectives Process for Hazardous Waste Site Investigations." Peer Review Draft. EPA QA/G-4HW. June.

Specific Comments

1. **Executive Summary, Pages ix and x**. The executive summary should include the conclusions of the risk assessment and should state that significant toxicity and risk for fish and invertebrates are associated with sediment and surface water at the Solutia facility.

2. **Section 2.0, Background, Pages 2 through 4**. The background description is incomplete. This section of the ERA should clearly identify the source and nature of the contamination under investigation and state that Solutia is currently a source of contaminants. The types of contaminants generated at the facility, the period of time over which contaminants have been released, the nature and extent of releases, and the media to which contaminants were released should all be clearly identified. Although some of this information may have been provided in earlier documents, a brief overview of site background information is necessary to place the ERA in context. In addition, the description of current conditions (DOCC) and other relevant reports should be cited. EPA guidance on problem formulation provides examples for the ERA to follow (EPA 1997).

3. **Section 2.2, Reference Areas, Pages 2 and 3**. The text should explain the purpose of the reference areas, whether they are considered to represent impacted or unimpacted ambient conditions, and how they were used in the risk assessment. If clean, unimpacted reference sites are not locally available along the Mississippi River because of the industrial setting, this fact should be clearly stated and supported with citations of published reports. Section 2.2 should also describe the nature of the comparisons that will be made between the plume discharge area (PDA) and the upstream from the discharge area (UDA) and downstream from the discharge area (DDA) sites.

4. **Section 3.0, Screening Level Assessment, Page 5**. This section of the ERA is incomplete. A screening level assessment typically includes the following screening-level elements: (1) problem formulation, (2) preliminary exposure estimate, (3) ecological effect evaluation, and (4) risk calculation (EPA 1994, 1997, 1998). This section provides a bulleted list of what should be included but does not discuss any of those items. In the ERA, problem formulation is deferred to the baseline ERA; however, the screening-level assessment also requires evaluation of the site, complete exposure pathways, and fate and transport. Section 3.0 should identify the methodologies, assumptions, sources of information, and screening benchmarks that were used in the screening-level assessment and should provide the results of that assessment. These results should support the need for further evaluation and should clearly identify the chemical stressors and the receptors that may be at risk.

5. **Section 3.0, Screening Level Assessment, Page 5**. The screening-level assessment should conclude by identifying contaminant sources, complete exposure pathways, and chemicals of potential concern (COPC) that will be carried forward into the baseline ERA. This section should explain why the adjacent river habitat is the only area to be evaluated in the risk assessment and why no other part of the site warrants investigation. Also, the screening procedures used and screening results are not presented. Section 3.0 should provide details regarding the screening benchmarks used, the media evaluated, and the specific statistical tests or other procedures used.

6. **Section 3.0, Screening Level Assessment, Page 5**. The screening-level assessment implies that "groundwater to sediment" is the only complete pathway at the site and that comparisons of groundwater volatile organic compounds (VOC) concentrations to maximum contaminant levels (MCL) provide sufficient information to support further investigation of the site. MCLs are not ecologically-based criteria. The screening-level assessment should result in a list of COPCs (based on all available data, including the more recent sediment and surface water data) that will be carried forward into the baseline ERA. Without a list of COPCs to be evaluated, the problem formulation in Section 4.0 lacks focus.

7. **Section 4.0, Problem Formulation, Pages 6 through 13**. This section of the report is incomplete. No risk hypothesis or decision criteria are defined for the risk assessment as specified in EPA guidance (EPA 1997, 1998). Decision criteria for each line of evidence should be closely linked to the data quality objective (DQO) process used in development of the sampling and analysis plan.

8. **Section 4.1, Conceptual Site Model (CSM), Pages 6 through 8**. The CSM should clearly identify the contaminant source or sources (for example, the Rivers Edge Landfill or site groundwater). The CSM should also identify each exposure pathway that is complete or potentially complete. Complete and potentially complete exposure pathways should be further identified as either "complete and will be quantitatively characterized in the assessment" or "complete but insignificant and will not be characterized in the assessment." The CSM should also (1) specify whether groundwater is the only source of contaminants in sediment and (2) provide justification for considering contaminated surface runoff from the Solutia facility and other pathways between the primary contaminant sources and receptors incomplete. The "groundwater to surface water" pathway should be described in more detail in terms of flow direction, flow rates, and areas of daylighting; the onshore source for the groundwater; and how long the groundwater has been contaminated.

9. **Figure 4-1, Ecological Conceptual Model**. The model should distinguish between primary contaminant sources (groundwater, surface water-runoff, etc.) and receiving media or secondary sources (riverine sediment, pore water, and surface water). Moreover, the model should include arrows from fish prey to piscivorous birds. In addition, arrows representing complete pathways from "ingestion of soil, sediment, or water" to "larger omnivorous and piscivorous fish" and "foraging and piscivorous mammals" should be included.

10. **Section 4.1.1, Environmental Setting and Contaminants Known or Suspected to Exist at the Site, Page 6**. This text provides the first discussion of the environmental setting and contaminants and should be presented earlier in the ERA. This section should clearly identify the nature of Solutia operations and how VOCs and semivolatile organic compounds (SVOC) were released at the site. This section should also describe the onshore habitat beyond the shoreline and explain why that area is not included in the risk assessment. A more complete description of the riverine habitat under evaluation is also needed for the problem formulation; much of this information is not presented until Section 8.2.1.

11. **Section 4.1.2, Contaminant Fate and Transport Mechanisms, Page 7**. COPCs have not yet been identified, so the references to "COPCs listed" and "site-related COPCs" are confusing. If all VOCs and SVOCs are considered to be COPCs at this point, the ERA should clearly state this. It is difficult to evaluate the adequacy of the fate and transport mechanisms listed when the chemicals under evaluation have not yet been defined.

12. **Section 4.1.2, Contaminant Fate and Transport Mechanisms, Page 7**. The following mechanisms are listed in this section but are not included in the conceptual model in Figure 4-1: particulate runoff from the watershed (presumably this includes surface runoff from Solutia) and erosion and deposition of sediment. The text description and figure should be revised to clarify which pathways are complete.

13. **Section 4.1.3, Mechanisms of Ecotoxicity and Likely Categories of Potentially Affected Receptors, Page 7**. This section begins by stating that the COPCs may affect survival and reproduction of various biota. This statement is hard to evaluate without knowing what the COPCs are. VOCs and SVOCs are broad categories that include many different types of chemicals with different ecotoxicological effects. If all VOCs and SVOCs are COPCs, the text should address different classes of chemicals with different ecotoxicological mechanisms.

14. **Section 4.1.4, Complete Exposure Pathways, Page 8**. In this paragraph, "sediment to fish via direct contact and ingestion"

should be added to the list of complete exposure pathways. In addition, ingestion of sediment during feeding activities should be added to the "fish to piscivorous birds and mammals" pathway, and pore water should be added as an exposure point for benthic invertebrates.

15. **Section 4.2, Identification of Receptors, Page 8**. The term "contaminants of concern" is used twice in this section even though COPCs have not yet been identified. The text should be revised to indicate which chemicals are COPCs.

16. **Section 4.2, Identification of Receptors, Page 8**. A schematic presentation of the riverine food web highlighting guilds selected for evaluation should be added to this section. Also, this section discusses a feeding guild approach for selecting receptors for evaluation; however, "warm water fish species" is not a feeding guild, as it includes many different taxa with different feeding modes and habitat requirements. The representative fish species selected for evaluation belong to different feeding guilds. The ERA should be revised to provide the appropriate fielding guides for the fish species selected.

17. **Section 4.2, Identification of Receptors, Page 9**. The discussion of warm water fish species indicates that buffalofish were collected to support a human health risk assessment. The text should cite the report that documents the human health risk assessment or should state that this assessment is currently being conducted.

18. **Section 4.2, Identification of Receptors, Page 12**. The text should cite a reference for the information on the home range of the otter.

19. **Section 5.1, Assessment Endpoints, Page 14**. It is not clear why the assessment of warm water fish species incorporates assessment of aquatic invertebrates. Enough information is available to assess potential effects of contaminants on aquatic invertebrate populations (for example, invertebrate toxicity benchmarks, site-specific toxicity test data, and benthic community metrics). Because of their importance in the food web, aquatic invertebrates should be evaluated as a separate assessment endpoint. This comment was also made during development of the sampling and analysis plan.

20. **Section 5.2, Measures of Effects, Page 14**. The text should describe measurement endpoints, why they were selected, and how they will be used in the weight of evidence process. Also, decision criteria stating how each line of evidence will be interpreted should be provided in this section. Moreover, a table summarizing sample sizes for all media and analytes should be included in the ERA, as none of the current data tables provides sample sizes.

21. **Section 6.0, Exposure Assessment, Pages 15 through 19**. The discussion in this section is inadequate and is not consistent with EPA guidance. Add a discusson of contaminant sources, distribution of stressors, and co-occurrence of stressors and contaminants.

22. **Section 6.1, Data Used in Ecological Risk Assessment, Pages 16 through 19**. The text should discuss the validity and usability of the data rather than just referring to the data usability reports. In addition, this section should identify data gaps associated with nondetect results for chemical concentrations above screening levels. For completeness, the text should also include a qualitative assessment of exposures and effects associated with chemicals with reporting limits above the criteria or the uncertainty associated with lack of information on exposure.

23. **Section 6.1.1, Sampling Locations, Page 16**. Samples collected 2 feet above the bottom should not be considered "sediment-water interface" samples, as that term usually refers to the thin boundary between these two media. Therefore, the sampling design should not be characterized as measuring chemical concentrations at the sediment-water interface, and the design is not necessarily "conservative" because of the mixing that would occur in the 2-foot layer of water above the riverbed.

24. **Section 6.1.1, Sampling Locations, Page 17**. Section 6.1.1 indicates that one-half the reporting limit was used for nondetect results. Rather than using "ND" for nondetect results in the summary tables in Appendixes A-1, A-2, and A-3, the reporting limit or one-half the reporting limit should be presented for each nondetect result; in addition, the tables should be formatted so as to clearly identify which values are nondetect results. "ND" does not provide any quantitative information for evaluation unless the reporting limit is also provided.

25. **Section 6.1.2, Calculation of Polychlorinated Biphenyl (PCB) and Dioxin/Furan Concentrations, Pages 17 and 18**. The basis for concluding that a given chemical does not pose a risk should be documented; eliminating a chemical from further evaluation simply because it was not detected is not consistent with EPA guidance. The ERA should document the basis for concluding that a chemical does not pose a risk by confirming that reporting limits did not exceed ecologically-based screening criteria. Also, because Solutia historically manufactured Aroclors, PCB results should be included in the data tables, and the associated reporting limits should be screened against appropriate toxicological benchmarks. For nondetect results, total PCB concentrations should be calculated based on one-half the detection limit to assess whether total PCB concentrations exceeded toxicological benchmarks.

26. **Section 6.1.3, COPC Selection Process, Pages 18 and 19**. The text should include an explicit evaluation of the uncertainty associated with nondetect results in cases where the reporting limit exceeded the toxicological benchmark. Compounds that were not detected but whose reporting limits exceeded toxicological benchmarks should be retained in the risk assessment.

27. **Tables 6-1, 6-2, and 6-3**. The reporting limits should be provided for nondetect results in these tables; in addition, the tables should be formatted so as to clearly identify which values are nondetect results. "ND" does not provide any quantitative information for evaluation unless the reporting limit is also provided. It is not possible to evaluate a screening process by comparing "NDs" to criteria unless it is known whether the reporting limits exceed the criteria.

28. **Table 6-2**. The detection frequency should be provided in Table 6-2. Also, an orange highlight is used where the average concentration is higher than the maximum concentration. A table note should explain how this is possible. Presumably nondetects play a role in this apparent discrepancy, but no information is currently provided on how average concentrations were calculated.

29. **Table 6-4**. The table should be revised to include chemicals whose reporting limits exceed the selected criteria, such as chemicals listed in Section 8.1.4.1.

30. **Section 7.0, Ecological Effects Assessment, Page 20**. The effect assessment discussion is inadequate and is not consistent with EPA guidance. Rather than presenting a bulleted list of what should be discussed, this section should present the results of all measurements and analyses of effects, such as toxicity tests, comparisons of tissue concentrations to effect levels, food chain modeling, and so on. Also, toxicity tests should be included in the bulleted list. In general, stressor-response relationships, the toxicological nature of COPCs, and linkage of measurement and assessment endpoints should be the focus of the section. The text does not discuss the ecotoxicological nature of the chemicals on the COPC list. The measurements and analyses relevant to effect assessment should be presented in this section. The risk characterization should focus on integrating exposures and effects and on interpreting the spatial extent and magnitude of potential risks.

31. **Section 8.0, Risk Characterization, Pages 21 through 38**. The text currently in Section 8.0 should be placed in Section 7.0. The risk characterization discussion should focus on the spatial extent and magnitude of potential risks indicated by each line of evidence and the weight of evidence process.

32. **Tables 8-1 and 8-2, Effects Associated with Fish Tissue Burden**. A reference should be cited for each no-effect toxicity

reference value in Table 8-2. Also, "NDs" should be replaced with the reporting limit or one-half the reporting limit to allow quantitative comparisons.

33. **Section 8.1.3, Toxicity of River Water and Sediments to Fish Measured by Surface Water and Sediment Toxicity Tests, Page 24.** The text should describe the validation process that was used to verify that the toxicity test results are valid. For example, the text should describe the process used to determine that laboratory conditions and controls met requirements, standard operating procedures were followed, etc.

34. **Section 8.1.3, Toxicity of River Water and Sediments to Fish Measured by Surface Water and Sediment Toxicity Tests, Page 24.** The surface water samples were collected 2 feet above the bottom of the riverbed, not at the sediment-water interface. Thus, the sample analytical results should not be considered "conservative" measurements of chemical concentrations at the sediment-water interface.

35. **Tables 8-4b and 8-6a, Surface Water and Sediment Guideline Comparison.** The chemicals that have nondetect results and that have reporting limits exceeding the selected criteria should be retained in the risk assessment.

36. **Section 8.1.4.3, Sediment Toxicity Testing, and Section 8.1.5, Sustainability of a Planktonic Invertebrate Community that Can Serve as a Prey Base for Fish, Pages 30 through 32.** The analysis of toxicity test results is incomplete. The potential cause of the toxicity observed should be explored using correlation analyses to determine whether any chemicals are significantly correlated with toxicity.

37. **Appendix C, Table C-1.** Table C-1 is not cited in the text, and it is not clear what the table's purpose is; no units or explanations are provided. Based on the uncertainty section, it appears that this table relates to volatilization of VOCs during the toxicity tests. This information is important in interpreting the toxicity test results and should be discussed explicitly in the effect assessment.

38. **Section 8.2.1, Wildlife Species Composition and Habitat Use, Pages 33 through 35.** The qualitative discussion of habitat, special status species, and other wildlife species present in the site area should be placed in the introductory problem formulation section. The anecdotal and qualitative information provides context for the selection of representative receptors and does not warrant being considered a "measure of effect."

39. **Section 8.2.3, Concentration of COPCs in Forage Fish, Predator, and Bottom Fish for Use in Evaluating Exposure Via the Food Chain for Great Blue Heron, Osprey, and River Otter, Pages 36 through 38**. The consent order requires that maximum exposure point concentrations be assessed. The food chain modeling approach should therefore use maximum tissue, sediment, and water concentrations in the initial dose estimate, not as part of an ad hoc sensitivity analysis. If effect levels are exceeded, average concentrations can then be used to further refine the risk estimate. Using the average tissue concentration in the three fish species underestimates risk; the maximum concentration for the three fish species should be used in cases where it is not known which species is consumed by the bird or mammal being evaluated. Maximum sediment and surface water concentrations detected in the foraging area should be used in the initial dose estimate. Also, the text should explain how nondetect results were used in deriving exposure point concentrations.

40. **Appendix D, Food Chain Model Parameters**. The text should explain the relative availability factor (RAF) and how it was derived. If the RAF is a measure of bioavailability, full documentation of this parameter is needed. Also, this parameter should appear in Table D-2.

41. **Appendix D, Food Chain Model Parameters**. The assumption of 0 percent incidental sediment ingestion for the great blue heron is low, as herons eat crayfish and bottom-dwelling fish. No relevant literature values are available, but an assumption of two to three percent is reasonable and should be used.

42. **Appendix D, Tables D-12 to D-47**. The table formats should be revised to address problems with cells having values that are not readable. A larger font should be used to improve the readability of the tables.

43. **Section 9.0, Weight of Evidence Discussion of Ecological Risk, Pages 39 through 41**. The magnitude and spatial extent of observed effects should be discussed in sufficient detail to fully support the conclusions presented.

44. **Section 9.1, Sustainability of Warm Water Fish Species Typical of Those Found in Similar Habitats, and Table 9-1, Pages 39 and 40**. The sustainability of aquatic invertebrate populations should be a separate endpoint. In addition, lines of evidence based on toxicity tests involving invertebrates (the test measured the toxicity of sediment to benthic invertebrates and the toxicity of river water to planktonic invertebrates) should be given high weight as direct measures of effects.

45. **Section 10.0, Sources and Management of Uncertainties, Pages 42 through 47**. The quality assurance project plan (QAPP) presents project DQOs developed in accordance with EPA's seven-step DQO process (EPA 1999). The uncertainty discussion should specify whether project DQOs identified in the QAPP were met.

46. **Section 10.1, Exposure Assessment Uncertainty, Pages 42 through 44**. Chemicals whose reporting limits exceed selected criteria or whose QAPP-specified reporting limits were not met should be retained in the risk assessment, even if they were not detected.

47. **Section 10.4, Toxicity Test Uncertainty, Page 45**. The loss of VOCs from toxicity test samples during testing and the resulting underestimation of risk should be considered in the interpretation of toxicity test results in the risk characterization.

48. **Section 11.0, Summary and Conclusions, Page 48**. The conclusions should identify the areas and chemicals posing the greatest risks to fish and invertebrates based on exceedances of selected criteria and correlations between toxic effects and chemical concentrations. The conclusions should also identify chemicals whose concentrations were higher at PDA than at UDA and DDA and whose presence is likely due to potential sources at the WGK Plant. In addition, the conclusions should identify the complete exposure pathways that must be addressed to reduce risks. The ERA conclusions should guide risk managers toward a remedy by identifying chemicals of ecological concern, media affected, the magnitude of the risks, and areas that should be the focus of risk management efforts.

49. **Appendix F, Table F-1**. The location where the U.S. Geological Survey gage height and stream flow data were collected should be identified.

50. **Appendix F, Table F-2**. The grain size range for each grain size category should be identified in a note to the table.

51. **Appendix F, Table F-4**. References should be cited to identify the sources of the information in this table.

REFERENCES

U.S. Environmental Protection Agency (EPA). 1994. "Ecological Risk Assessment Guidance for RCRA Corrective Action - Region 5." Region 5 Waste Management Division. October.

EPA. 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments." Interim Final. Office of Solid Waste and Emergency Response. EPA 540-R-97-006. June.

EPA. 1998. "Guidelines for Ecological Risk Assessment." EPA/630/R-95/002F. April.

EPA. 1999. "Data Quality Objectives Process for Hazardous Waste Site Investigations." Peer Review Draft. EPA QA/G-4HW. June.